



SPECIAL  
REPORT



# UNDERSTANDING SMART TVS

**Best 4K TV,  
OLED TV, Streaming  
Media & More**

# Get Ready for Your **NEW SMART TV**



If it's been a few years since you have bought a new TV, well, a lot has changed. No longer is it enough to go into a store and simply look for the best picture and sound. The advent of smart TVs has turned the typical display device into an all-in-one media center. This is good news, because you now get a lot more functionality for your money; however, it also means there are many more features you need to learn about and consider.

## **What is a Smart TV?**

For the past two years at least, nearly every HDTV on the market has also been a smart TV. When these products first started emerging, we called them Internet TVs or connected TVs or a few other terms that have fallen out of use to be replaced by Smart TV. In short, a smart TV is any television that supports an Internet connection and online content services. Often, smart TVs include advanced features such as voice or gesture control, voice search, social media integration, app control and universal search features. The more features the TV has, the smarter it is.

The most popular feature on a smart TV is online media streaming. Services like Netflix, Amazon

Video, VUDU, Cinema Now, Pandora, Slacker and more offer instant gratification for people who like a wide assortment of content available at their fingertips. A smart TV with media streaming and an Internet connection requires no extra hardware to be a complete entertainment hub. This has traditional cable companies a little upset because many customers have decided that directly-streamed Internet content is all they need, so they forgo those expensive cable subscriptions. Along with that, it's important to remember that every HDTV sold today includes a digital over-the-air tuner for broadcast television networks. An inexpensive TV and a broadband Internet connection can often provide all the television content a family could ask for.

### Where do you start?

When selecting a new TV, you'll first need to decide how you plan to use it and what you want to watch on it. If you're convinced that online streaming services are not for you, and you don't want to learn how to use any new features, then look for a very basic smart TV. These days you'll have trouble finding them, but some of the less popular TV brands still offer barebones TVs at bargain prices.

**TIP:** *A smart TV with multiple streaming services is a good choice for a bedroom, den or kitchen, where installing an additional cable box would be difficult.*

**SIZE:** TVs have gotten bigger and thinner over the years. There are several rule-of-thumb approaches to selecting the appropriate size TV, and most of them suggest a larger size than you had originally anticipated. This is because they're based on field of view, and sometimes resolution. Instead of calculating the TV based on your field of view, instead consider how much space you have. You probably have more space than you believe. Today's TVs have almost no bezel around the picture screen, and that lets you fit more TV into the same amount of space as your older TV. The average viewer sits about 10 feet from his/her living room TV. At this viewing distance, a 60- or 70-inch HDTV is not out of line. THX recommends a 40 degree field of view, which means that if you sit 10 feet from your TV you should be watching a 100-inch screen. If you opt for a new 4K Ultra HD TV, then your eyes wouldn't even notice pixels if you were five feet away.

**TIP:** *Our rule of thumb is to get the biggest TV that your wall space can accommodate. For a family's main TV nothing smaller than 55 inches will do.*

**DISPLAY TECHNOLOGY:** The selection of display technologies available on TVs today is a lot simpler to comprehend now than it was just a couple of years ago. There are two main choices among 1080p resolution TVs: LED LCD and plasma. Just a few years ago you'd need to decide between LCD and LED LCD, plus DLP rear projection. The LCD and DLP options are largely gone. In fact, plasma TVs have also mostly been phased out, much to the disappointment of a lot of TV enthusiasts. Only Samsung and LG still make plasma TVs (and Samsung won't for very much longer), and just a few at that. So essentially you have a choice between a few models of plasma and a lot of LED LCD TVs. If you're looking for the best picture quality, especially if you plan to watch TV with the lights on and the window

shades open, then check out the better plasma TVs. Other than that, LED LCD is the way to go.

There are two different types of LED LCDs: edge lit and backlit (sometimes called full-array). Unlike a plasma TV, an LCD panel doesn't actually produce any light itself. It requires a light source to create the picture—that's the LED part (light emitting diode). TV manufacturers can either put the LEDs on the sides and then use a system of light channels to pipe the light behind the TV, or they can place the LEDs directly behind the TV. Edge-lit TVs have the benefit of being thinner (centimeters in some cases) and often cheaper than full-array models. Because of the placement of the LEDs, often edge-lit TVs will produce some uneven distribution of the lighting—this is usually seen in the form of brighter spots around sides or corners during very dark scenes of a movie.

Full-array or backlit LED LCD TVs usually make up a company's line of premium offerings. In a full-array model, the LEDs are divided into multiple zones behind the LCD screen. If the TV has a feature called Local Dimming (different manufacturers may call it slightly different things), then the LEDs have the ability to dim or turn off individually for dark sections of a picture. This produces a better contrast ratio (the difference between the TV's blackest and whitest picture) and better black reproduction. The more dimming zones the better. Some edge-lit TVs also include local dimming features, and while they work, they're not as effective as dimming on true backlit TVs.

**What about OLED?** OLED (organic light emitting diode) TVs may be the next big thing in TV display technology, but there are only a few models on the market now, and for most people, they're prohibitively expensive.

**What about 3DTV?** Around 2009 3DTV seemed to be on a rocket ship trajectory. But like the exhaust of a rocket ship, the fad quickly faded. While now almost every TV over 32 inches is a 3D TV, it's now just a standard, rather than a premium feature. The number of 3D movies and 3D Blu-ray releases has also dropped as viewers have pegged 3D a gimmick they don't much care for. Still, if you like TV, then you have two choices of 3D: Active or Passive.

Active 3D TVs use battery operated glasses (\$50 to \$100) with built-in LCDs that act like shutters in sync with the alternating frames of a 3D video. Passive 3D puts most of the work in the screen, rather than in the glasses, so they use simple and cheap (\$10 to \$20) polarized glasses, similar to what most 3D movie houses use. Both systems work pretty well, but in a 1080p TV, the passive 3D method reduces a video's resolution by half.

# Choosing Your **SMART TV**



Smart TV features range from basic media streaming by a handful of video and music services, to very advanced systems that completely change the way you interact with your TV.

## **Super Advanced Smart Features**

Here are some of the top smart features found on today's Smart TVs:

- **Interactive menu or guide:** Because today's smart TVs have the ability to include hundreds of streaming media applications, TV companies have developed easily navigable interfaces to help you find, download (or purchase), and organize your online content. Some TVs even allow you to create separate profiles for each family member, so dad can log into the TV and find his favorite streaming services without having to navigate around all the games and kid channels that the children have added.
- **Full web browsing.** Yes, you'd think this would be standard on any smart TV, but surprisingly, it's not. If you want to look up something on a web browser without having to open up your laptop every time, this is a feature you'll want.

- **Advanced remote:** Because the TVs have gotten more advanced, better remotes were needed to make it easy to use the TV. Some include full built-in keyboards (a nice feature when web browsing), while others use gesture or voice prompts to access favorite features. Imagine speaking into your remote to select a movie.
- **Voice control:** Voice control features allow you to operate some of the functions of your TV by simply speaking to it (or into a microphone on a remote). You can change channels, adjust the volume and sometimes search for content or browse the web, all by talking. Currently these features seem more like gimmicks than finalized options, but they're fun to use.
- **Gesture control:** Like voice control, a few new smart TVs allow you to control some TV functions by pointing and waving. They work by incorporating a small camera into the TV, which can also be used for video chats online, games or facial recognition features.

### What if you like your TV, but want to add smart TV features?

Let's say you own a TV you already think is awesome, but you love the idea of online streaming apps, social media integration or advanced control? Many of these features can be added to an existing HDTV or home theater projector by buying a settop box or other product.



Streaming Media Boxes like Roku, Amazon's Fire TV or Apple TV are full of smart TV features, including streaming video and music, games, social media apps and some advanced controls. These can be added for about \$100 and connect to your existing TV or projector system via HDMI.

Video game consoles like Xbox One and PlayStation 4 also include a wide assortment of streaming media options, as do most Internet-connected Blu-ray players.

Another option is the Roku Stick (\$50) or Google Chromecast (\$35). These devices look like USB memory sticks, but they plug into your TV, include built-in Wi-Fi radios, and allow you to access multiple streaming media services. The Roku Streaming Stick comes with a remote, while the Google Chromecast enlists your Android smartphone as the remote.

### What matters in picture quality?

Picture and sound quality are typically the two most important features people mention when looking for a new TV, although they're mostly deceiving themselves about sound quality. Why? Because ALL TVs sound terrible. Some sound less terrible than others, but they're all pretty bad compared to the next best option—a soundbar or soundbase. Now, let's get back to picture quality.

**Black Level:** While resolution is important, black level and color saturation are the two most critical features in a TV's picture quality. You'll often see TV manufacturers touting ridiculous contrast

### Basic TV Features You Need:

- HDMI inputs (4 or more)
- Audio output mode
- Deep image controls
- Front or side Inputs
- App control
- Audio Return Channel
- Discrete input selection
- RS-232 or IP control
- Wi-Fi and Ethernet
- USB

## Choosing Your Smart TV

ratios (which is related to black level, but not quite the same thing). Black level refers to the TV's ability to produce actual black (as opposed to dark gray). Few TVs do this very well. The TVs that do it best happen to be plasma TVs (but those will be gone soon), and there are fewer of these on the market now than in previous years. OLED TVs are also able to produce stunning blacks along with rich colors, but for most people OLED TVs are priced out of their budget.



**Color.** It's easy to be impressed by reds and greens that seem to glow on the screen, but are they accurate? Look at the colors around you, then look at the colors on the TVs you're interested in buying. Does the TV accurately reflect reality?

*TIP: When viewing TVs in a store showroom, know that they probably haven't been calibrated and are usually set at the brightest, most unnatural mode. If possible, ask to have the TVs switched to their Movie, Cinema or Theater mode (which is going to make the colors in the picture look a lot more realistic).*

**Brightness.** Is a bright TV necessary? Yes, we want our TVs to be bright so we can easily see the image during the day or when the lights are on. Except for a few budget models, most TVs today are more than bright enough for any room. Some TVs are even designed to be bright enough, and glare resistant, for outside viewing (they're also weather resistant). Plasma TVs used to be thought of as dimmer than LCD, but new plasma TVs have plenty of brightness for all but the brightest rooms (rooms that are mostly windows). Sometimes a TV that's too bright can either wash out the blacks and colors in an image, or be overly fatiguing to the eye. A properly calibrated TV is not as bright as the showroom models.



**Viewing Angle:** Some TVs, especially LED LCD HDTVs, lose color saturation and brightness when viewed from extreme angles. You don't generally notice this when you see them in a store, because most people stand directly in front of the TV when checking it out. At home the situation may be different. If you have seats and sofas spaced widely around the room, viewers seated at the extreme sides will probably see a slightly decreased image than viewers seated directly in front of the screen. Look for a TV with a wide viewing angle so everyone in the room gets the same good experience.



**Picture Artifacts:** Artifacts are elements in a picture that shouldn't be there. Jagged edges, mosquito noise around objects, pixilation and visible steps in colors are all examples of picture artifacts. The hard part about eliminating them is finding out what part of your system is causing them. Artifacts may come from the TV signal, the cable box, the disc player, the receiver or be produced by the TV itself. Sometimes even the setting you selected on your TV can produce unnatural results. The best TVs include video processors that reduce or eliminate most noticeable artifacts.

**Resolution:** Any TV you get today will be at least high definition resolution and expressed in terms like 1080i, 720p, 1080p or the new 4K. All but the least expensive and smallest TVs now on the market are at least 1080p. Resolution is important, though most video experts say it's not the most important factor in picture quality. Depending on where you sit and how large your TV is, the highest resolution may not be important in your home.

**The Bottom Line:** In a store, position yourself the same distance and height as you would be from the center of the screen in your own living room. Overall, look for a TV that makes blacks look black, that can show the differences between subtly different blacks (for instance, look at a black leather chair, notice that the black looks a little different around the folds and curves (due to how the room light is reflecting off the chair angles). A TV with good black levels will show all these nuances. A TV with poor black reproduction will not. Look for natural looking colors—grass that is the actual color of your lawn, and not a cartoon green. Watch for smooth motion and smooth edges. Beware of a TV that has bright spots on the edges or corners—this will come to annoy you a lot after a while.





# **4K** Smart TVs are --- **THE NOW BIG THING**

The biggest thing to hit the smart TV business lately is the advent of 4K or Ultra HD TV. So what is a 4K TV? Basically it refers to a TV with significantly greater resolution than a standard HDTV.

HDTVs as we know them today mostly come in what's referred to as 1080p resolution, which means there are 1,080 pixels vertically and 1,920 pixels horizontally to create a picture. A 4K or Ultra HD (the official title for these TVs) television needs to display a resolution of at least eight million active pixels, with at least 2,160 vertically and 3,840 horizontally in a 16:9 aspect ratio.

In addition to the higher number of pixels, and greater pixel density (less empty space between the pixels), the other advantage of 4K TVs is a greater color space—newer 4K TVs will be able to display a broader range of color detail than can the current crop 1080p TVs.

What's the benefit of upgrading to a 4K TV to the user? The most noteworthy is that you can sit closer or get a larger TV and still not perceive any pixel structure on the screen. Having more pixels means the pixels are much smaller, so you won't see them even if you scoot your seat way up close to the screen. For people who love a really big, totally immersive TV experience, 4K is the technology to get.

Currently, 4K Ultra HD TVs are priced a bit higher than even the best 1080p TVs, but the major TV

manufacturers (and even the lesser-known ones) are very serious about their 4K business, so prices are coming down. In fact, it's pretty certain that in a few years, all new TVs will be 4K TVs (similar to how 720p transitioned to 1080p).

### What Can You Watch on a 4K TV?

It's important to make clear that with a 4K TV you can still watch anything you watch now, and most likely (depending on the TV) it will look better than it does

on your 1080p TV. Image processing is everything. Your current 1080p TV (assuming you're not watching an older 1080i, 720p or standard resolution TV) upconverts most of your content anyway. All those 480p DVDs or 1080i/720p TV programs go through an image processor to scale them to your TV's native resolution without looking like they've just been shaken through a flour sifter. All 4K TVs do this too, and some better than others. Because the availability of 4K content is limited currently, most of what you watch will be lower-resolution media upconverted by your TV.

But 4K content is already here. Netflix is currently offering several of its popular programs in Ultra HD, and plans much more for the near future. According to Netflix, a broadband Internet connection of 15Mbps is all that's required for 4K video streaming.

Aside from Netflix, several other online streaming services are planning to do 4K (some have already started), including Amazon, Comcast Xfinity, DIRECTV, M-GO and more.

Ultra HD media servers are another source of 4K content. Both Sony and Samsung offer hard drive products that store 4K movies and more for viewing on their Ultra HD TVs.

The Digital Entertainment Content Ecosystem (the group behind UltraViolet—the online movie locker, not the sci-fi movie) may also be adding a 4K solution to UltraViolet.

An Ultra HD Blu-ray disc format is also being developed, and may be coming to market within a year.

### What About Curved and Widescreen TVs?

Curved TVs first emerged in 2013 as 1080p OLED models from LG and Samsung. They were gorgeous as only OLED can be, but the curve was something unexpected. These first models also couldn't be mounted to the wall.

The 2014 curved TVs are a mix of 4K and OLED (some are both). The curve itself is subtle. It may not detract much from the picture, but it probably doesn't add much, if anything either. Consider it more of a design element. If you like the sleek look of a flat TV snug up against a wall, then skip the new curved options, which will cost more anyway.



The ultra-wide, 105-inch 21:9 aspect ratio TVs hitting the market are another thing. They're big and wide, making them perfect for CinemaScope movies, but maybe not so hot for plain old HDTV viewing (those extra pixels on the side will need to be doing something). The models shown were also curved (except for Toshiba's prototype), and will also be very expensive.



# Tips for New TV Buyers



If haven't bought a new TV in a few years, you may be surprised by all the new tweakable features they come with now. New TVs offer myriad options beyond color and contrast controls. If all you do is unbox your new TV and put it on the wall, you'll be missing out on all that a new set has to offer.

By complying with the following recommendations, you'll ensure that your new flat-panel friend is humming along, delivering HD goodness to one and all.

## **1. Don't overuse motion enhancements**

This applies mostly to LED/LCD sets. The feature is designed to minimize the stuttering that sometimes plagues the picture of an LCD TV during motion scenes. You may see it listed as an Hz specification (120Hz, 240Hz) or a clever marketing name (TruMotion, Motion Plus, MotionFlow, CineMotion, and so on). Be careful, some sets might even have two different motion enhancement settings.

At its most basic, the idea behind this technology is to reduce blur and pixilation during fast moving action scenes. Older model LCDs used to be notorious for something called the "screen door effect," which is when the picture would break down during sporting events or action scenes. Better refresh rates have helped to minimize this issue in newer LCD/LED sets, even without the use of motion smoothing technology.

When activated, especially to its highest setting, motion smoothing technology can turn a picture hyper-realistic, making film-based material look like a 1980s sitcom. Start with these enhancements turned off, and if you feel that your picture is struggling to keep up with fast action, slowly increase the setting.

## 2. Watch the material how it was meant to be seen

Filmmakers spend a lot of time tweaking their material to get it exactly how they want it. In an ideal world, your TV would simply be a conduit to view that perfect picture. Since each set is calibrated differently at the factory, sadly, this is not the case.

In addition to motion enhancements, there are several other picture tools that can negatively affect a TV's output when set to their highest levels.

Locate and either disable or set to "0" any noise reduction or mosquito noise, edge enhancement, skin tone, or shadow detail enhancements when you first set up your TV.

You may eventually switch some of these options back on, but when they are all on at the same time (as is the case sometimes right out of the box) the alterations to the native picture can be too strong.

## 3. Turn down the lights

When you wander up and down the aisles at your local big box retailer, there's a reason it feels at times that you might need sunglasses. In most cases, the TVs are set to what's called "torch mode." In an effort to draw your eyes to the TV, brightness and color settings are turned way up as each screen strives to capture the most attention.

When you get home, however, these settings are overkill for regular home viewing. Almost every TV will come with a series of viewing scenes with names like "vivid," "theater" or "standard." The theater, cinema or movie setting generally provides the best picture right out of the box (unless you have a THX certified TV, in which case choose that setting). It's best to avoid the "vivid" or "game" setting for regular viewing.

One note when setting up a new TV: Be sure to give your eyes a chance to get used to any major changes you make to the picture. Watch for a couple days and if you're still not happy, tinker some more, but avoid making snap judgments.

If you're looking to take things to the next level, there are several discs available for purchase that will walk you through a self-calibration (such as Digital Video Essentials, Disney's WOW, and Spears and Munsil).

No one article can help you squeeze every last bit of awesomeness out of your new TV, but following these basic tips will get you up and running and on your way quickly.

If you spent a lot on your TV and you want to ensure you have the best, most accurate picture it's capable of delivering, hire a calibrator to fine-tune the TV professionally. This goes double for projectors, because they tend to have more picture control options and are more sensitive to the room and screen conditions.



# Choosing a TV:

## WHAT THE PROS LOOK FOR

What's really important when buying a new TV? Should you focus on finding a screen with great black levels, brightness, or resolution? Is picture the most important factor when selecting a TV? What about cosmetic design? And let's not forget about the abundance of online features and smart interaction tweaks that are showing up on new TVs.

The thing is, when selecting a new TV, sometimes it's that one little thing that'll influence how you spend your money.

When you're working with a CE Pro who is helping you make these decisions and installing the gear, he may have features in mind that you wouldn't normally be thinking about.

I asked some home theater pros to share their thoughts on what they look for, besides picture quality, in a television.

First I turned to Joel Silver, founder of the Imaging Science Foundation. He's one of the people responsible for raising people's awareness of professional TV calibration. Silver notes that the ability to calibrate a TV properly is critical to getting the best picture out of it, which means that the TV needs to have the proper features available for a trained technician to use. These days finding a calibration-friendly TV is pretty easy, especially when you're looking among the top lines from the dominate manufacturers. True discrete codes for inputs and on/off is also important when programming a control system or universal remote. In addition, he looks for TVs that allow the calibrator to lock in the settings so the user can't accidentally change something vital.



## Here's what some other CE Pros say about important TV features:

“Actually, ‘brightest image’ is not highest on our list of attributes. Dynamic range is more important to us, which is ‘contrast’ in layman’s terms. We try to determine if viewers have a narrow viewing cone—looking straight ahead at the TV, or do they have a casual, relaxed room layout.

The set that wins the ‘drag race’ in the showroom doesn’t always equate well to the experience in the home environment. Bright images, particularly from edge-lit LED sets, can be like staring at a lamp shade for a couple of hours in a darkened room. With plasma, for example, the only light you see is actual content, so there is no wasted light. Fatigue is less of an issue when watching for an extended period of time. Backlit LEDs with local dimming seem to do a good job as well. As far as ‘features’ are concerned, discrete on/off is pretty important, along with a good set of picture adjustment controls. Outside of that, the usual palette of networking features will suffice.”

*John Selby*

*Stereo One, Inc.*

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“It depends on what we are doing with it. For instance if I am doing an automation system, I will either sell the clients (or suggest they buy) a certain brand that I know has solid drivers and has discrete on/off commands, etc. And with AppleTV out there for \$99 the entire smart TV thing is a moot point to me. I’d rather use a no nonsense, all picture quality display with one HDMI these days for less money because those online features in your actual TV aren’t needed.”

*David Huse*

*Theater Advice L.L.C.*

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Like the dealers and installers above, Dave Wexler of the The Little Guys, rates control capabilities high on his list of must-have features. An RS-232 connection is superior to IR (infrared). He also looks for discrete input control so the user doesn’t have to scroll through a list of inputs to get to the correct one.

He also looks for TVs with a quality anti-glare coating or similar feature to reject room light. Unless the TV is going into a dark media room, there will probably be room light bouncing around from windows or lamps. This light can significantly impact a picture in a normal room.

*David Wexler*

*The Little Guys*

*Mokena IL*

If you're interested in learning more about smart TVs check out these useful resources

Find an Installer: Locate a professional in your area who can set you up with your dream system.

EH Daily: Helpful articles on a variety of home tech topics.

EH Library: The most complete resource for smart home technology research.